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ABSTRACT

This report contains brief descriptions of 37 published and unpublished works and ongoing studies produced by a project designed to investigate the ways in which both children and adults comprehend and remember connected discourse. Among the topics of the published works, which include articles, book chapters, and a book, are the following: story structure versus content effects on children's recall and evaluative inferences; goals, inferential comprehension, and recall of stories by children; the effects of organization and instructional set on story memory; integrating research and instruction on reading comprehension; learning disability as an attention problem; event chain analysis and inferences in understanding narratives; and information integration by children. Among the topics of the unpublished works, which include theses, technical reports, and papers presented at professional meetings, are: children's comprehension and evaluation of intentions and consequences; the making and the assessment of inferences during reading; narrative analysis; preschool children's understanding of emotional states in terms of causes and consequences; goals, themes, inferences, and memory; mode of presentation and story comprehension; and the use of story schema to remember picture sequences. Topics of the ongoing studies include encoding and recall of picture sequences; comprehending and remembering moral dilemmas; causes and consequences of narrative events; and critical issues in story comprehension. (FL)

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FINAL REPORT

Grant No. NIE-G-77-0018

INFERENCING BY CHILDREN FROM CONNECTED DISCOURSE

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The research reported herein was performed pursuant to a grant with the National Institute of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions do not, therefore, necessarily represent official National Institute of Education position or policy.

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The central goal of the research summarized herein was to understand how children as well as adults comprehend and remember connected discourse. The general way in which they are assumed to do this is to use their existing knowledge to interpret the events in the flow of discourse, to construct a representation of the discourse in memory by connecting the events via logical or causal relationships and to fill in missing events by making inferences. The main kind of discourse investigated has been simple stories. Comprehension and inferencing of verbal or pictorial narratives were studied by use of importance judgments, free and probed recall, recognition and verification tests as well as moral judgments.

During the period from 6/1/77 to 9/15/79, the project resulted in eleven published articles and book chapters, one edited volume, three technical reports, two doctoral theses, two master's theses, seven papers read at professional meetings and ten studies which are still in progress. In this report, the eleven publications and the current ongoing studies are briefly described. Those other reports which are not as yet published are also noted.

A. Publications

1. Gnepp, J., Klayman, J. & Trabasso, T. A hierarchy of information sources for making emphatic inferences. Child Development, in press.

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Children 4-, and 8-years in age as well as adults preferred to use setting information about personal habitual actions to infer accurately emotional reactions to initiating events that were consistent with or frustrated the goals implied by the habitual actions of the protagonist over information having to do with group norms or situational factors. These data showed high ability on the part of 4-year-olds to infer emotional states from these sources in stories and suggest that the omission of reactions from recall of stories results from the use of macrostructure rules such as deleting those events which are highly predictable rather than from a failure to understand internal states as had been supposed by developmental psychologists such as Flapan.

2. Greuneich, R. & Trabasso, T. The story as a social environment: Children's comprehension and evaluation of intentions and consequences. In J. Harvey (Ed.) Cognition, social behavior and the environment. Hillsdale, N.J.: Lawrence Erlbaum Associates, in press.

This chapter uses the concept of a well-formed story as described by "story grammars" to analyze stories used by investigators who study evaluative inferences in an area of research called "moral development." The ability of children to use internal, subjective state informations, particularly intentions as opposed to objective events or actions as con-

sequences in the making of moral judgments is examined. The analysis of existing stories showed that the omissions of internal state information, temporal confounding of intent/outcome and explicit outcome reference biased young children towards focusing on outcomes rather than on intentions. When intentions are made explicit or when the order is inverted as outcome/intent, then intentions receive more weight. Piaget's claims about the relative weight placed on outcomes versus intentions in evaluative inferences may be artifacts of method. The paper develops a set of rules for how intentionality (responsibility and foreseability) of actions and outcomes may be inferred from story information using ideas from Heider and Kelley.

3. Nezworski, T., Stein, N.L. & Trabasso, T. Story structure versus content effects on children's recall and evaluative inferences. Cognitive Psychology, in press.

In studies of retelling of stories by children, certain events are better recalled than others, namely settings, initiating events and direct consequences. The omission of internal states and reactions has been taken to be a lack of ability to understand these events (Flappan in 1968) or because these events are redundant or predictable. However, the question of category function and its salience in recall is confounded with content. In this study, key propositions were

embedded in the same story as different categories (settings, initiating events, internal states, direct consequences and reactions) and children 5 to 8 years in age, recalled the stories and made moral judgments of the characters. The data showed that the recall of the propositions was independent of the categories (i.e., all recalls were about equal) and that the moral judgments were also independent of the category. The latter result bears upon an earlier issues raised by Greuneich and Trabasso (A. 2. above), namely that children can infer higher order motives from any source of information. The fact that the embedded information was goal-related may have increased its importance and led to better recall. That is, any category of information which is related to the goals and purposes of the protagonist and is causally related to other propositions will be entered into the memory representation of the story over those events which are not causally or purposefully related. This suggests that some internal state and reactions, notably, affective states are not purposefully related and, therefore, are discarded in comprehension. Omanson's thesis (C. 1a. below) tests these ideas more explicitly.

4. Nicholas, D.W. & Trabasso, T. Towards a taxonomy of inferences. In F. Wilkening, J. Becker, & T. Trabasso (Eds.) Information integration by children. Hillsdale, N.J.: Lawrence Erlbaum Associates, in press.

This paper describes a general model for comprehension which connects events into a causal chain via inferences. The causal chain follows Schank's view of memory for narrative events. The paper distinguishes between backward and forward relations for focal events and classifies the inferences that can be made into seven broad categories, including pronominal and nominal reference, causal relations, enablements, spatial, temporal and world frame inferences. Several examples and functions of each kind of inference for understanding narratives are described.

5. Omanson, R.C., Warren, W.H. & Trabasso, T. Goals, inferential comprehension and recall of stories by children. Discourse Processing, 1978, 1, 337-354.

This experimental report studied how well children, 5 to 8 years in age, could retain premises related to inferences probed by questions following the listening to of a story. The children were matched on how well they retained each proposition related to an inference. While the percent correct inferences increased with retention, the 8-year-olds consistently outperformed the 5-year-olds. Therefore, the ability to connect propositions increases with age and is independent of recall per se.

In a second experiment, on 8-year-olds, the interpretation of an ambiguous passage was made possible by a prior context. Although more inferences were made as a result of having a prior context, the memory of the key propositions in the text

was not affected. This study also shows that inferencing may be independent of recall. That is, you can remember something and not understand it or you can understand something but not remember it.

The Nicholas and Trabasso (A. 4. above) taxonomy was used to classify inferences in both experiments. No consistent differences were found across the types, either for age groups or stories. Thus, the taxonomy did not seem to have any psychological significance with respect to age differences or stories.

6. Stein, N.T. & Nezworski, T. The effects of organization and instructional set on story memory. Discourse Processes, 1978, 1, 177-193.

This experimental study investigated some implications of story grammars as schemas that are used to guide comprehension of narrative events. Adults were asked either to recall a story in its exact, presented form or to try to make it into a story where the sentences were (1) well-formed, (2) slightly disordered, (3) randomly disordered or, (4) unrelated. The data showed that retention was directly related to the order of these conditions and that more inferences in the make-a-story instruction occurred and led to improvements in recall across all conditions. In particular, the temporal order in which events were recalled in conditions (1) through (3) was more in line with a canonical story form than in the exact recall condition. Thus, the use of a story schema facilitates connecting, ordering and recall of narrative events and may underlie, in part, how well events are understood in stories.

7. Trabasso, T. Can we integrate research and instruction on reading comprehension? In C. Santa and B. Hayes (Eds.) Children's prose comprehension: Research and practice. Newark, Delaware: International Reading Association, in press.

The paper reviews reviews of three areas: basic research, instructional research and instruction in reading. A critical analysis of each review is given along with suggestions of how some of the shortcomings may be met. For example, the heavy emphasis upon free recall as a measure of comprehension is criticized. The curriculum of Montgomery County School, Rockford, Md., is described with reference to all three research areas, and suggests a wider range of reading comprehension activities than were covered in the areas reviewed.

8. Trabasso, T. Is the learning disability problem one of attention? In J. Yesseldyke and F. Morrison (Eds.) Multiple perspectives on assessment of learning disabled children. Baltimore: University Park Press, in press.

This review comments on the correlational nature of the evidence that attention deficits are causes for learning problems by children. Alternative causes and models for attention that may more precisely indicate the locus of the problem are discussed.

9. Trabasso, T. On the making and the assessment of inferences during reading. In J.T. Gutherie (Ed.) Reading comprehension and education. Newark, Delaware: International Reading Association, in press.

This paper, intended for teachers and researchers of reading, relates inferences to questions that may be used to assess or promote comprehension. The paper defines inferences, using examples from several recent studies, describes their functions in constructing a representation of a story, considers what is required for making inferences as well as how we make them, provides a taxonomy, especially for goal-related, causal inferences which have been found to be crucial to comprehension, and ties in a question-asking procedure with these inferences so that one can more systematically ask questions that have a theory-based rationale for promoting or assessing comprehension.

11. Trabasso, T. & Nicholas, D.W. Memory and inferences in the comprehension of narratives. In F. Wilkening, J. Becker and T. Trabasso (Eds.) Information integration by children. Hillsdale, N.J.: Lawrence Erlbaum Associates, in press.

This paper examines research on inferences from prose material by children, notably that of Paris and Trabasso. A critical analysis of the methods and conclusions using false recognition paradigms developed by Bransford and Franks for

adults. Several methodological suggestions are made for improving on this and other experimental paradigms. The need for systematic analysis of inferences is developed.

12. Warren, W.H., Nicholas, D.W. & Trabasso, T. Event chain analysis and inferences in uderstanding narratives. In R.O. Freedle (Ed.) New directions in discourse processing, Vol. II Advances in discourse processes. Norwood, N.J.: Ablex Publishing Corporation, 1979.

A procedure for analyzing narratives into a memory representation is described. The analysis consists of first laying out a narrative in terms of the key propositions on a time line. Then, a list of all protagonists is made. Then, all proportions are classified as states or actions with further subclassifications of states in them of emotional etc., states or voluntary and involuntary actions. The same event may be represented from different points of view for different protagonists. Then, and most important for a theory of inferences, are the connections made between the classified events. These connections are causal or temporal in character and give rise to a taxonomy of inferences. The basic idea is that the person, in understanding a story constructs such a representation using causal or temporal relational knowledge. The taxonomy leads to the use of systematic process on comprehension (see Trabasso, T. "On the making etc. above). This paper was an advance over the Nicholas and Trabasso

(in press) paper and captures several ideas of Schank and his students who have worked on artificial intelligence and narratives.

12. Book: F. Wilkening, J. Becker & T. Trabasso (Eds.) Information integration by children. Hillsdale, N.J.: Lawrence Erlbaum Associates, in press.

The edited collection of ten papers focuses on how and what rules children use to integrate information (make inferences) across a variety of situations and tasks. The papers study how children combine information about physical dimensions such as area and size to information about intentions and consequences in making judgments as to goodness. The book is a result of a conference held in Kassel, Germany in the summer of 1977. It is the best current summary in one source of a variety of approaches to how children combine information to construct representations of events. Several of the authors are German nationals and the conference was sponsored by the Volkswagen Foundation. The book should help stimulate work on inferential abilities by children in Europe as well as the U.S.

A. Technical Reports

1. Nezworski, T., Stein, N.L. & Trabasso, T. Story structure versus content effects on children's recall and evaluative inferences. Technical Report 129. Center for the Study of Reading, University of Illinois at Urbana, Champaign, June 1979 (described in A. 3. above).

2. Greuneich, R. & Trabasso, T. The story as social environment: Children's comprehension and evaluation of intentions and consequences. Technical Report No. 142. Center for the Study of Reading. University of Illinois at Urbana-Champaign, September, 1979 (described in A. 2. above).

3. Trabasso, T. On the making and the assessment of inferences during reading. Technical Report No. (to be assigned). Center for the Study of Reading, University of Illinois at Urbana-Champaign, February, 1980 (described in A. 9. above).

C. Theses

1. Doctoral theses

1a. Omanson, R.C. The narrative analysis. Ph.D. thesis, University of Minnesota, August 1979.

Omanson extended the work of Nicholas & Trabasso (in press), Warren, Nicholas & Trabasso (1979) and Nezworski, Stein & Trabasso (in press) in two major ways: analytically and empirically. Using theories of action, he refined the content analysis of narrative events but retained the causal relationships. Then, he assumed that those events which are both causally and purposefully related would be "central" to a representation of a story. He identified central and peripheral content, a priori, using the analysis on prior studies by Bartlett, Mandler & Johnson, Stein, Glenn and others. In his

analysis, he showed that the central content was recalled better immediately over time and was correlated with variations in story structure and content.

In an experiment, he systematically varied whether the same content (internal states and reactions) would be central or peripheral in different story contexts. The measures used were immediate and 24-hour delayed recall, importance ratings and summaries. The data showed that central content is more likely to be recalled, is less likely to be forgotten over time, is more likely to be rated important and is more likely to be summarized. In addition, the same events, namely cognitions, emotional states or goals or actions may be affected in similar ways depending upon whether they are central or not.

There are two important main contributions here. First, Omanson's analytic approach provides an a priori way for deciding upon important content. Second, the category recall finding of the story grammar research depends heavily upon whether the content is central. Omanson is currently developing a paper for publication of his thesis work.

1b. Greuneich, R. Children's use of intention and consequence information in making evaluative inferences. Ph.D. thesis, University of Minnesota, October 1978.

Greuneich used Anderson's information integration theory (a mathematical model for describing decision rules) in a study of how children connect three levels of intentions and three levels of consequences. The study was on children 5, 8, and 11

years in age. The order of the intentions and consequences was counterbalanced since strong order effects had been found on the younger children. After hearing a story, the children recalled it and rated the protagonist on an evaluative inference scale. The main findings of interest were that (1) children at all age levels combined information from all levels of both the intentions and consequences in an additive manner and (2) that estimated weights for the intentions varied with order for the younger children but not for the 11-year-olds.

In the earlier work on moral development (Piaget and others), the weight of the intent or consequence was confounded with both the intrinsic value of the respective source of evaluation and with story order. Greuneich unconfounds order experimentally and the weights of intentions and consequences mathematically and showed that the weighting of consequences is an order effect for younger children. This paper is currently under consideration for publication in Child Development.

2. Master's theses

2a. Nezworski, T. Story structure versus context effects on children's recall and evaluative inferences. M.A. thesis, University of Minnesota, October, 1978 (described in A. 3. above).

2b. Surbey, D. Preschool children's understanding of emotional states in terms of causes and consequences. M.A. thesis, University of Minnesota, August 1979.

If children connect events in narrative via causal and other

relations, then their ability to generate causes and consequences of events may underlie how well they can understand events and construct a memory representation of a narrative. Hence, inferences, in the form of generation of antecedent causes and consequences, may be studied independently of text comprehension.

Surbey undertook the study of emotional states as a special case since they are not well recalled by children in stories and because research on "empathy" suggested that young children are not accurate in predictions or differentiating emotional reactions to story contexts. Our own work on 5-year-olds seemed to suggest that they are quite accurate at using sources (see A. 1. above). In his thesis, Surbey had children, 3 to 5 years in age, generate a cause or consequence to pictured children who were described as happy, excited, surprised, sad, angry or scared. The answers were categorized into 37 types and the types were subjected to cluster analyses on correlations of distributions of children over the types. The data indicated accuracy in assignment of cause/consequence of about 85 percent overall. The cluster analysis showed complete discrimination between positive and negative emotions and excellent discrimination within these sets. Scared was totally differentiated while the positive emotions showed more overlap.

This pioneering study on emotional state understanding by preschool children is now being written up for publication in collaboration with L. Johnson, N. Stein and D. Surbey. Following

work on older children is being planned currently with Reid Schwartz at U. Chicago.

D. Papers read at Professional Meetings

1. 1978

a. Nezworski, T., Stein, N. & Trabasso, T. Story structure vs. context effects on children's recall and evaluative inferences. Psychonomic Society, San Antonio, Nov. 1978 (described in A. 3.)

b. Trabasso, T. Cognitive prerequisites to reading. In a symposium headed by J.T. Gutherie, entitled, "Information supply and demand in reading," American Educational Research Association, Toronto, March 1978.

In this paper, the correlational nature of factors assumed as affect early reading is critically examined, suggesting that what are frequently considered to be prerequisites are actually outcomes of learning to read or practice at reading. Few skills are prerequisites; some may facilitate; many are consequences and some are correlated with a third, independent factor. Specific programs which either facilitate early reading skills are discussed.

c. Omanson, R., Warren, W.H. & Trabasso, T. Goals, themes, inferences and memory. American Educational Research Association, Toronto, March 1978 (discussed in A. 5. above).

2. 1979

a. Asp, S., Johnson, L. & Trabasso, T. How does the mode of presentation affect story comprehension? In a symposium entitled "Critical issues in the development of story comprehension skills," N. Stein (Chairperson), American Educational Research Association, San Francisco, April 1979.

The question of whether children extract and represent pictorial narratives using story-like schema was studied by comparing recall and probed comprehension (inferences based upon propositions in the story or missing events). Kindergarten and second grade children either viewed a picture story or listened to a verbal narrative written according to story grammar of Glenn and Stein for the pictures and then recalled the stories and answered questions testing literal and inferential comprehension. The central hypothesis is that if they encode events in story schema that the two modalities would yield a common structure and similar recall and comprehension results. The children encoded and recalled the text and picture sequences in highly similar ways, reporting similar goals, failed attempts, successful consequences and reactions. The differences that occurred were in non-goal related details for pictures and internal responses or emotional reactions that were made explicit in the texts. The inferences were probed using the Warren, Nicholas & Trabasso (1979) Taxonomy and showed no reliable differences between modalities. In general,

children appear to encode and retrieve similar amounts and kinds of information about stories which fit the categories of story grammars, suggesting a common "deep structure" representation.

In addition to modality affects, a cohesive effect was found. The ease with which college students could reconstruct scrambled sentences or pictures into a story which matched our original order correlated highly with recall and inferences across the set of stories. The latter finding is consistent with the general view of this grant proposal, namely that comprehension consists of making meaningful interpretations of individual narrative events and relating them to one another by semantic or logical inferences.

This research is nearly complete as far as analysis is concerned. A paper is being prepared for publication in a professional journal.

b. Day, J., Stein, N., Trabasso, T. & Shirey, L. A study of inferential comprehension: The use of story schema to remember picture sequences. Society for Research in Child Development, March 1979.

This study addresses the same question as does the one above, namely, do children abstract information from pictures and organize it in a fashion similar to that occurring during oral story comprehension? In addition, the relation between encoding and retrieval was studied by having children describe picture stories and then recall them.

Children were pre-schoolers (4-years-old) and second graders (7-years-old) and each child encoded and recalled two picture story sequences in one of two conditions: when the story was well-formed or when the consequence picture was moved to the second position in the sequence, causing a slightly disordered sequence.

The main findings were that the encodings could be described by the story grammars as varying approximations (about 6 levels) from an unrelated list of setting statements to a well-formed episodic structure with all categories included. The level of structure was very highly correlated with recall (r = .80) indicating that the more logical and causal the encoded representation, the more likely the child was to recall the elements encoded.

The other set of results has to do with story schema and the handling of a disordered event. When the consequence was moved, children encode it twice, once early and once in its normal position and make more inferences regarding it. In recall, however, it is deleted from the non-logical position. Hence, they used a well-formed schema in recall, even though one was not used in encoding.

The data analyses on this study are now complete and a paper for publication in a professional journal is being prepared.

c. Trabasso, T. On the making and the assessment of inferences during reading. International Reading Association pre-convention workshop, Atlanta, May 1979 (described in A. 9. above).

d. Trabasso, T. Can we integrate research and instruction on reading comprehension? International Reading Association. Atlanta, May 1979 (described in A. 7. above).

d. Stein, N.L., Trabasso, T., & Garfin, G. Comprehending and remembering moral dilemmas. Symposium on understanding discourse (Susan Goldman, Chair) American Psychological Association, New York, September 1979.

This paper extends our work on comprehension of stories in two directions: to stories involving goal conflict and resolution as well as moral development. Kohlberg's approach to moral development uses stories that involve alternative courses of action (goal conflicts) but focuses on classification of open-ended judgments and not on how such stories are understood. Our analysis, closely resembling classical models of conflict resolution (Lewin) and recent ones in natural language understanding (Willensky thesis at Yale) breaks down the dilemmas into the competing goals and outcomes. By presenting the child with stories where the protagonist acts or doesn't act and asking the child why the protagonist does/doesn't act as well as what happens next, it was possible to infer whether the child understood all aspects (goals and outcomes) of the dilemma.

We found that children 5, 7, and 12 years of age did, in fact, comprehend all goals and outcomes. However, the youngest children focused on the more recent, direct outcomes, as Piaget

found. Either they are prone to recency effects or they place less weight on death as a negative outcome.

E. Studies in Progress and Manuscripts in Preparation

1. Modality effects on comprehension and recall of narrative events by young children. With S. Asp and L. Johnson (described in D. 2a.). All data analyses are now complete. Written manuscript for publication in a professional journal is in the planning stage. Either the Journal of Experimental Child Psychology or Journal of Educational Psychology would be appropriate outlets.

2. Encoding and recall of picture sequences. With J. Day, N.L. Stein and L. Shirey (described in D. 2b.). All data analyses are now complete. Written manuscript for publication is in early stages. Either Child Development or Journal of Fxperimental Child Psychology are appropriate outlets.

3. Comprehending and remembering moral dilemmas. With D. Garfin and N.L. Stein (described in D. 2e.).

This study yielded an enormous amount of data. Although most of it has been analyzed, using conventional analyses of variance procedures, we found that our model for dilemmas yielded far more interesting results. We are now in the process of re-analyzing one of the stories in two conditions in detail. This may not be sufficient for a published paper but if it is, we plan to with a theoretical paper along with the data for

Discourse Processes. We are currently planning a study which extends this one and controls for order and importance of events.

4. Modality effects on comprehension and recall of stories: II. With L. Johnson and E. Knight.

This study extends the one by Asp, Johnson and Trabasso (see D. 2a. above). In the prior study, the children heard a story following viewing pictures of the same or an unrelated story versus hearing or viewing alone. In Knight's study, the effect of simultaneously viewing a story and hearing it is compared against seeing it alone or hearing it alone. If children translate the pictorial sequence into the same underlying representation as that in verbal narratives, then we don't expect much facilitation of the visual form. Recall and inferential probe data have been collected on children 5 to 8 years in age but have not as yet been analyzed. The expectation is that these data will be analyzed in the spring of 1980.

5. Causal inferences and logical justification of cohesive and non-cohesive narrative events. With L. Johnson, R. Simon and N. Stein.

This study compares the child's ability to answer why and because completion questions as distinguishes from How do you know (logical justification questions). One issue in cognitive development and causal reasoning is that why and because are not understood with respect to antecedent/consequent

relations until about age 7 and that logical justification comes in much later, roughly age 10-11. We devised a procedure for comparing causal interpretations of why and because as distinctive from their justification interpretations. This is done by selecting three events in succession from a narrative sequence, called E_1, E_2, and E_3. Focus on E_2 and ask either why E_2?, E_2 because? or How do you know that E_2 happened? In different conditions, E_1, E_2 and E_3 are causally related or E_1 is unrelated to E_2 and E_3 or E_3 is unrelated to E_1 and E_2. If children interpret Why and Because as asking for an antecedent cause, they should answer E_1 when causally related but not when it is unrelated. Likewise, if they interpret How do you know that? as asking for justification, they should give E_3 when it is causally related but not when it is unrelated.

This study has been carried out as part of an M.A. thesis by R.A. Simon at Minnesota and the data analysis is nearly completed. Preliminary data analysis indicates that 5- and 8-year-old children treat Why and Because alike and make appropriate antecedent causal inferences for a systematic sample of all narrative events in an episodic sequence when they are causally related. Therefore, the children are not just using antecedent, temporal relations. Justifications, however, proved exceptionally difficult for the younger children. The analysis and writing should be completed in the spring of 1980.

6. Causes and consequences of narrative events. With L. Johnson and N. Stein.

In this production study, children, 5-, 8- and 11-years in age generated free associations in a story context, causes or consequences to each of 20 different narrative events, systematically sampled from story analysis. Since developmental psychologists notably Piaget, have claimed that preoperational children don't distinguish between cause/effect and "juxtapose" (give free associations), this study, in part, is a direct test of the claim. More importantly, the kind of events given as causes or consequents is of interest because it indicates the causal knowledge that children have to interpret and relate states and actions in an event chain. For example, emotional states are end-states in narratives and one would expect causes to be easier to generate than consequences. When asked about actions, goals should be frequent causes and state changes should be frequent consequents. However, causes of physical events should be other events, etc. Our data analyses have yielded results consistent with these expectations for all groups.

We have done extensive data analyses on both sets of questions. With respect to developmental abilities we found extremely high accuracy in generating plausible cause/consequence relations and that all three conditions differ in content and category of content generated. However, cluster analyses indicate remarkably little or no age-related differences. The structure of the causes/consequences are nearly identical within conditions for all three age groups.

This study shows that meaning of events can be studied using a cause/consequence paradigm as relates to the emotional State Study of Surbey (described in C. 2b.). We have completed nearly all of the analyses on this study and are organizing a monograph-length article. We also intend to report three studies on cause/consequence understanding in an ivited chapter.

7. Comprehending emotional states in terms of their causes and consequences. With L. Johnson, N. Stein and D. Surbey (described in C. 2b. above).

This study is completely analyzed and will be written up as an article for publication in a professional journal, most likely to be Child Development.

8. Using causal antecedent and consequent questions to promote or assess comprehension. With R. Omanson.

Since the general comprehension model guiding this research is one that emphasizes connections of a logical/causal nature between events, then one way to promote (or assess) such comprehension is to ask children why or what happened next questions during the listening to a text. We did this in an initial study, using picture stories and 8-year-old children. For each focal picture (either in a set of 3 successive story events or one-at-a-time) we asked why the event occurred and what happened next. In the context of three pictures, we hope to show that accuracy of understanding these relations correlates

with subsequent recall of the stories. These data are in the early stage of analysis.

9. Critical issues in story comprehension. With N. Stein.

This is a review of the state of the art chapter which is currently being written for R. Glaser's volume 2 of Advances in Instruction. This chapter discusses theory, data and issues of narrative comprehension work from the early inception of story grammars up to the current problem-solving approaches. The chapter is about half-complete at this time and should be done in three months.

10. Detection of inconsistent information with N. Stein and E. Sulzby.

If children predict events from other events, then their predictions, when disconfirmed should lead to more inferencing and detection of anomalous relations. There has also been some recent interest in "comprehension monitoring" by Markman, Flavell and Baker which relates to this question. We designed an experiment which we thought would be highly sensitive to children's ability to generate expectancies and detect inconsistencies. The basic stories consist of a person whose trait is described (kind) in a context which calls for consistent (kind) or inconsistent (mean) behavior with the trait and an action which is also consistent or not with the trait. Following recall of the story, we probed generally to very specifically whether the child heard something wrong with the story. We also used moral judgment ratings and justifications and

detailed why probe questions on the actions.

Preliminary analyses indicate that one-third of the kindergarten and two-thirds of the second graders detect inconsistencies between traits and actions. The data are undergoing analysis and should be completed by summer, 1980.

F. Summary

Comprehension and memory for narratives and narrative events has been studied using the causal event chain and story schema approaches. The causal event chain approach emphasizes the logical, semantic and causal connections that are made between the conceptualizations underlying events in the narrative while the story schema approach emphasizes the category nature and function of the events (e.g., settings introduce characters; goals motivate plans and attempts). Both kinds of knowledge are used to construct a representation (interpretation) of the text which is stored in memory and used for subsequent retelling of the story, answering questions or determining important units.

One line of research has been to explore the implications of the causal chain approach with respect to (1) the kinds of inferences made and (2) the ability of children at different ages to make cause/consequence as well as other kinds of event-connecting inferences. One important finding is that, although the types of inferences did not vary in difficulty with age, the ability to make such inferences was independent of memory for the propositions and increased with age when these occur in

narrative contexts. However, the study of inference generating ability per se, in production studies suggest that children at all age levels and as young as 3 years have considerable causal knowledge about narrative events. The difference in age-related studies, then, must depend upon their respective abilities to both hold and connect the information in working memory. The use of on-line, adjunct questions during listening or reading may help shed light on this kind of ability.

The story schema approach has led to studies which show that children encode picture stories with such schema and remember best those events which are encoded in a well-formed structure. The encoding of picture stories resembles that for verbal narratives on the same events. Story content recall, however, does not seem to be related to the grammatical category of the events. Rather, the semantic structure is far more important -- children as well as adults construct a representation centering on the causal-purposeful relations within the story. That is, the goals, plans, attempts and outcomes are central and when content is so related, it is recalled, summarized and rated as important, independent of the grammatical category. Thus, narrative analyses, which can a priori identify central content can, in theory, predict which events will be comprehended and remembered. The causal-purposeful nature of events seems to be that which people look for in understanding stories.

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